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Acquiring core capabilities through organizational learning: Illustrations from the U.S. military organizations*

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Abstract. This paper focuses on the development of core capabilities through organizational learning. It insists on the variety of learning types which must be articulated in order to provide organizations with effective core capabilities. Principal illustrations are drawn from the U.S. military education and training initiatives in the context of the Network-Centric Warfare (NCW). Discriminating between various learning and training mechanisms according to their (i) type, (ii) level and (iii) context, we develop a conceptual framework to study organizational learning as a dynamic capability which enables the organization to develop core capabilities.

Key words. Organizational learning, Core capabilities, Dynamic capabilities, Military organizations.

* Ideas expressed in this contribution are those of the authors and do not reflect the position of the French Ministry of Defense nor of the French Air Force.

1. Introduction

In the field of organization science and strategic management, the question of the acquisition of core capabilities is critical (Dodgson, 1993; Teece and Pisano, 1994). Within this framework, the central issue is to understand how organizations acquire, exploit and adjust their core capabilities in responding to complex circumstances. Many scholars refer to learning as a context-dependent process leading to the creation, storage, and further refinement of routines, competences and capabilities (Nelson and Winter, 1982; Teece et al. 1997; Prahalad and Hamel, 1990; Leonard-Barton, 1992). In this respect, learning is critical since (i) it represents the act to acquiring organizational knowledge, and (ii) capabilities become core through learning and experimentation.

Despite a strong diversity¹, learning usually splits into two broad categories: individual learning and organizational (social or collective) learning. The main difference between the two categories is not simply related to the adoption of a particular micro *versus* macro level of analysis. Argyris and Schön (1996) clearly state the relationships between individual and organizational types of learning. The authors explain that organizational learning always involves learning at an individual level. Organizations ‘learn’ thanks to the cognitive efforts dedicated by individuals to acquire knowledge, and to use it in organizational settings. However, Argyris and Schön argue that individual learning does not necessarily generate organizational knowledge. Organizational learning does not simply correspond to the aggregation of individual learning outcomes. It emerges from the frequent interactions and communications among knowledgeable individuals within a group, a team or a community (Brown and Duguid, 1991; Amin and Cohendet, 2004). Therefore one should consider that core capabilities emerge through the articulation of various types of individual and collective learning, each type requiring distinctive knowledge processes and contexts to be managed (Nonaka, 1994; Davenport et al., 2001; Zollo and Winter, 2002).

Focusing on the development of core capabilities through organizational learning, this paper insists on the variety of learning types, levels and contexts which must be articulated in order to provide organizations with core capabilities. The analysis is based on an explorative

¹ Examples of learning mechanisms in organizational life are learning by doing, learning, by using, imitation, emulation, education, adaptive learning, cognitive learning, social learning, single loop learning, double loop learning, deutero learning, etc. See, Pawlowsky (2001), Teece et al. (2001), Brenner (2006), and Wang and Ahmed (2007) for surveys on the concept of learning in economics and management science.

methodology which offers the opportunity to understand underlying and non obvious issues (Miles and Huberman, 1995). Building on empirical illustrations, we seek to identify the basic properties of complex events and not to empirically test a theoretical object. As such, our purpose is analytical since it seeks to clarify and to improve our framework (Post and Andrews, 1982) in order to structure a wider research in the future. Principal illustrations of organizational learning are drawn from the U.S. military organizations. The U.S. military Services² offer relevant illustrations of organizational learning because they have to continuously transform their organizations, resources and competences in order to adapt to complex circumstances (Godé-Sanchez and Barbaroux, 2007). In particular, the U.S. military seek to acquire technical and non technical capabilities to fully exploit the benefits of network-centric technologies. Transformation toward a net-centric force has, in turn, a direct influence on the characteristics of the capabilities the U.S. military consider as critical. Subsequently, it has a direct impact on the learning and training initiatives the U.S military implement in order to create, transform, and disseminate core capabilities.

Next section develops a conceptual framework to study organizational learning as a dynamic capability which enables organizations to create, transform and disseminate core capabilities through the combination of distinctive types, levels and contexts of learning. Section 3, 4 and 5 present three education and training initiatives the U.S. military has implemented to develop and renew its core capabilities. Each section discusses their major implications for the study of organizational learning. Section 6 is conclusive.

2. Developing core capabilities through organizational learning: a framework

Analysing organizational behaviours in terms of perception, interpretation and memorization of events and data supports a view of the organization which has been largely adopted by scholars and practitioners (Dodgson, 1993). This view has two main qualities. First, it assumes that the organization is a knowledgeable entity capable to develop adapted responses to changing circumstances, through frequent interactions with its environment (Ashby, 1960; Holland and Miller, 1991). Second, it provides operational concepts and metaphors for building and refining models and visions of the organization as a learning, innovative and adaptive system (Simon, 1969).

² The U.S. forces are made up with four Services: the Army, the Air Force, the Navy, and the Marine Corps.

In line with this view, organizations are conceptualized as knowledge-based systems which are made up with heterogeneous, interacting units (e.g., individuals, teams, communities, divisions, and departments) that share organizational goals (Argyris and Schön, 1996), knowledge resources (Simon, 1991) and cultural values (Schein, 1992). Furthermore, these units are able to create, communicate and share a variety of knowledge types and forms (Lundvall and Johnson, 1994; Boisot, 1998) which, in turn, support the emergence, development and refinement of a variety of routines, competences and capabilities (Penrose, 1959; Nelson and Winter, 1982; Leonard-Barton, 1992). Next section (§2.1.) discusses the concept of core capabilities.

2.1. The concept of core capabilities and its multiple dimensions

It is frequently assumed that economic agents can observe and correctly interpret a variety of data by referring to existing knowledge structures which have been stored in their “memory” (Simon, 1969). Organizations’ sense making capacities, interpretative skills and problem solving expertise depend upon a variety of schemes, models, rules and values which have been maintained within organizational knowledge structures because they proved to be adapted to a wide range of problems. Such knowledge structures correspond to repertoires of core competences (Prahalad and Hamel, 1990), routines (Nelson and Winter, 1982; Levitt and March, 1988), and capabilities (Teece and Pisano, 1994).

In the 1990s, a particular debate came up, focusing on the ways through which organizational competencies can be built and leveraged in order to achieve competitive advantage (Hayes et al., 1988; Prahalad and Hamel, 1990; Pavitt, 1991). Within this framework, Prahalad and Hamel (1990) state that the real sources of advantage for organization are to be found in the management’s ability to coordinate and consolidate technologies and production skills into competencies. The authors assumed that such competencies become core when (i) they are rare, providing potential access to a wide variety of markets, (ii) they are valuable, making a significant contribution to the customer benefits of the end product and (iii) they are imperfectly imitable since they refer to complex coordination processes (Prahalad and Hamel, 1990: 83-84).

Following Leonard-Barton (1992), the notion of core competencies might be encompassed into the wider concept of core capabilities. Capabilities are developed by combining resources

in using organizational processes, within a specific organizational context (Amit and Schoemaker, 1993; Andreu and Ciborra, 1996; Sanchez et al., 1996). As competencies, capabilities are considered core if they differentiate a firm strategically (Barney, 1991; Leonard-Barton, 1992). However, the concept of core capabilities looks beyond the capacity to coordinate technologies and production skills. As Teece et al. (1997) suggest, it relies on the ability to articulate differentiated skills and knowledge, complementary resources, and routines. Skills are understood as the abilities people have to do things. Resources refer to any tangible and intangible assets actually available to an organization to use in pursuit of its goals (Sanchez, 2001: 7). Routines are usually defined as stable patterns of behaviour that characterize organizational reactions to internal or external stimuli (Zollo and Winter, 2002: 340). In that way, core capabilities are part of the organization. They are related to its system of rules and its culture, and are integrated in light of an organization's strategic direction (Wang and Ahmed, 2007: 36). Organizational processes through which core capabilities are leveraged are thus situated and closely linked to the organizational context.

Such an issue is highlighted by Leonard-Barton (1992) when she proposes a knowledge-based view of the firm to examine the nature of core capabilities. The author suggests that core capabilities are made up of four dimensions. The first one is called "skills and knowledge base" and encompasses both the firm techniques and scientific understanding. The second dimension concerns "knowledge embodied in technical systems". It results from the compilation and the codification of tacit knowledge, which derived from multiple individual sources within the organization. The third dimension of core capabilities is "managerial systems", which guides the processes of knowledge creation and control. Finally, the fourth dimension, called "values and norms", is infused through the three first one. Values and norms affect both the content and structure of knowledge and the means of collecting and controlling this knowledge within the organization. As Leonard-Barton (1992: 114) explains, values and norms bear the "imprint" of organization's founders and early leaders.

The organizational processes through which the four dimensions of core capabilities are interrelated are closely linked to the organization's activities and goals, at a given time, within a given environment. Scholars often reckon that core capabilities represent the unique heritage of the organization which results from path-dependent histories of organizations (Teece et al., 1997). In line with the competitive context, organizations must constantly adapt, renew, reconfigure and re-create their core capabilities. The literature on dynamic capabilities

stresses this issue in examining the evolution of core capabilities (Teece et al., 1997; Eisenhardt and Martin, 2000; Zollo and Winter, 2002). The concept of dynamic capability is thus closely related to the one of organizational learning. The latter should be considered as a dynamic capability which drives organizations' adaptation and change. Next section (§2.2) discusses the concept of organizational learning as involved in the evolution of core capabilities.

2.2. Organizational learning as a dynamic capability which articulates individual and collective learning

Conceptions of organizational learning are very diverse (Wang and Ahmed, 2007). In general, scholars discriminate between various types of learning in order to deal with distinctive levels of organizational learning, from simple adaptive learning to higher-orders reflective learning processes. One should therefore consider that organizations' repertoires of core capabilities are continuously shaped by combining different types and levels of learning.

Reviewing some literatures, Dodgson (1993) discriminates various approaches of learning in organizations by focusing on three main areas: the goals of learning, the learning processes *per se*, and the factors which might impede or facilitate learning in organizations. For all these areas, Dodgson (1993: 376) shows how different methodologies and disciplines lead to divergent explanations of organizational learning phenomena. To shed light on theoretical controversies, the author suggests that psychological explanations of individual learning should be used as fruitful metaphors for studying learning at higher – collective and organizational – levels (Dodgson, 1993: 377-378). Pawlowsky (2001: 62-74) also reports many approaches of organizational learning. The author identifies twenty different conceptions of organizational knowledge, and classifies the concept of organizational learning into five different perspectives³. Notwithstanding the major differences which result from distinctive behavioural assumptions regarding (i) the organization and its environment, and (ii) the selection of the relevant core dimension of learning as an organizational process, these different perspectives have two similarities.

³ Pawlowsky (2001) discriminates between the perspective of organizational decision-making and adaptation, the systems-theory perspective, the cognitive perspective and the knowledge perspective, the cultural perspective, and the action-learning perspective.

First, all approaches refer to the problem of articulating the individual level of learning to the group or organizational level of learning (Pawlowsky, 2001: 75). Even if this articulation is the source of debates between individualistic and holistic perspectives of organizational phenomena, a consensus has emerged among scholars (Nonaka, 1994; Argyris and Schön, 1996; Boisot, 1998; Zollo and Winter, 2002). This consensus revolves around the following hypothesis: organizational learning depends upon individual learning, but organizational learning do not reduce to the sum of individual learning outcomes.

Second, almost all approaches to organizational learning distinguish between various levels and types of learning. Zollo and Winter (2002) for example distinguish three types of learning, namely experience accumulation, knowledge articulation, and knowledge codification. The three mechanisms differ according to the degrees of cognitive effort and deliberation which are respectively attached to them. Bateson (1972) and Argyris and Schön (1996) distinguish three types of learning, each type of learning reflecting distinctive degrees of complexity and cognitive effort dedicated to knowledge-based activities. The authors discriminate between:

- Learning type I or single-loop learning corresponds to adaptive learning which consists in changing the action without modifying the rule that has produced it
- Learning type II or double-loop learning involves the modification of the rules, schemes, models, and values which comprise an organization's knowledge structures, and have generated the action under evaluation
- Deutero learning or learning type III (the highest level of learning) is about the modification of the learning process *per se*.

Notwithstanding the relevance of the previous typologies of learning⁴, we consider that the critical distinction is between two types of learning: individual and collective learning. In line with Argyris and Schön (1996), March (1991) and Nonaka (1994), we suggest that organizational learning depends on the articulation of individual and collective learning, each type of learning involving the coordination of distinctive knowledge-related levels and contexts. This view of organizational learning focuses on the process of how knowledge is shaped and made explicit, how it is created and shared, and how it is disseminated through a

⁴ These types of learning have also been analysed by March (1991) through his famous distinction between exploration of knowledge *versus* exploitation of knowledge.

variety of learning types (e.g., codification *versus* socialization; learning by doing), levels (e.g., single *versus* double loop learning), and contexts (e.g., learning in communities *versus* learning in teams or business units). Furthermore, it supposes that each type of learning can involve the creation, transformation, and dissemination of core capabilities according to the various dimensions identified by Leonard-Barton (1992). Hence, existing core capabilities might enhance learning if the dimensions involved in the development of new core capabilities are aligned with those currently present within the organization.

We suggest organizational learning should be considered as a dynamic capability (Teece and Pisano, 1994; Teece et al. 1997; Zollo and Winter, 2002) which enables organizations to combine various types and levels of learning (Argyris and Schön, 1996) in order to create, transform, and disseminate a variety of core capabilities (Leonard-Barton, 1992). Therefore, we build our framework on two major assumptions:

1. Organizational learning is a dynamic capability which articulates various types of individual learning and collective learning within appropriate knowledge-related contexts.
2. As a dynamic capability, organizational learning provides the organization with a fundamental mechanism through which competences and capabilities are created, tested, combined, stored and transformed, before they become core.

By focusing on organizational learning as a dynamic capability, we seek to explore the internal process by which organizations learn and develop new, strategically relevant resources (e.g., competences, routines and capabilities). It is therefore essential to take into account distinctive degrees of organizational learning complexity which depends on three factors: (i) the type, (ii) the level and (iii) the context of learning. Within this framework, we identify three degrees of organizational learning complexity:

1. First order learning complexity corresponds to the articulation of (simple) types of learning (e.g., learning by doing) which can be either individual or collective.
2. Second order learning complexity is based on the combination of distinctive learning types which relate to different levels (e.g., single *versus* double loop) and knowledge processes (e.g., tacit *versus* explicit knowledge).
3. Third order learning complexity relates to the articulation of different learning types, levels and contexts (e.g., learning in teams *versus* learning in communities).

Figure 1 provides a graphical view of the previous theoretical framework and assumptions called the Learning Space.

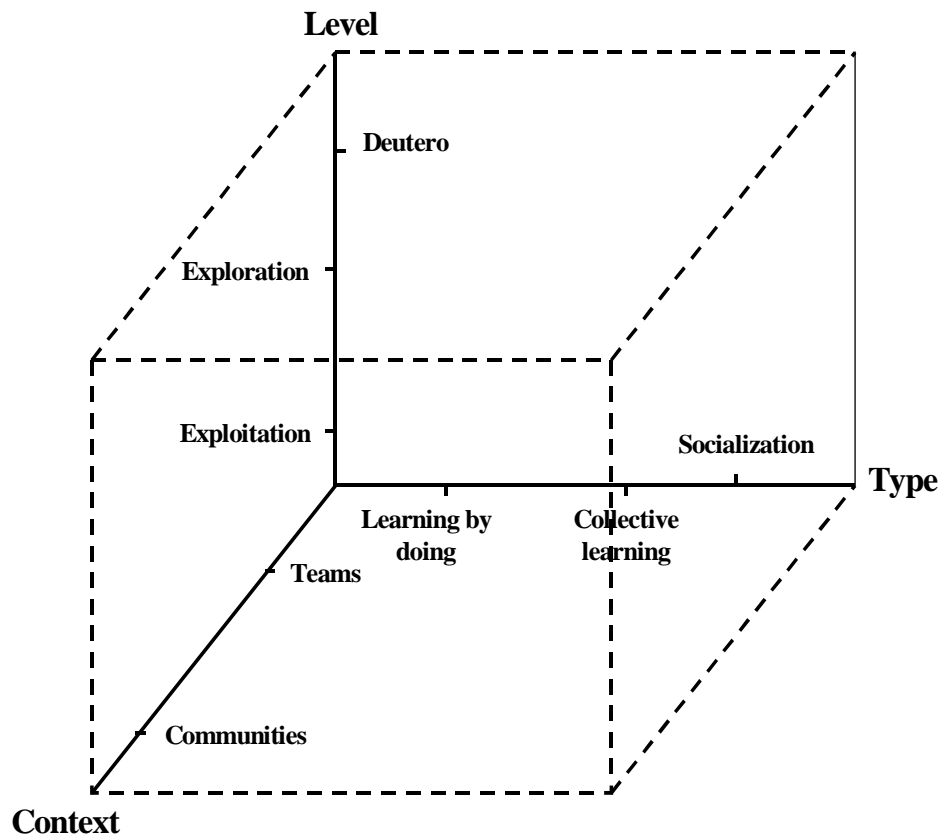


Figure 1: The Learning Space

Next sections (§3, §4, and §5) present and discuss case-based illustrations of organizational learning as a dynamic capability which articulates distinctive degrees of organizational learning complexity. Principal illustrations are drawn from the U.S. military education and training initiatives in the context of the transformation of its organization toward a network-centric force (Network-Centric Warfare, NCW). We investigate three illustrations of education and training programs which have been implemented by the U.S. military Services: (i) the digital training program (§3), (ii) the joint education and joint training programs (§4), and (iii) the center of the army for lessons learned (§5). Each initiative highlights some critical aspects of the complexity attached to organizational learning as a dynamic capability.

3. Developing “knowledge embodied in technical system” to fully exploit new technologies

Transformation consists in reinventing how operations are conducted to fully exploit information technology and to foster knowledge-sharing among geographically dispersed units. In the process of transforming itself, the U.S. Army reckons the digitalization of the battlefield as one of its highest priorities. Digitalization is about leveraging the forces’ capabilities through the use of network-centric technologies as digital map, shared up-grading databases, text-chat, email, etc. Effective uses of these technologies might provide and maintain an accurate vision of the battlespace to support both planning and execution of missions. Reports from Afghanistan and Iraq point up such improvements, especially concerning knowledge acquisition and knowledge sharing between units (Toomey, 2004; Collins, 2006; Johnson, 2006). However, promises of digital systems are not fully realized and sub-optimal operational results are frequently reported. Warfighters are confronted to a new set of problems concerning information overloading (Wilson, 2005), technological complexity (Fox, 2004; Toomey, 2004) and software fast up-grading (Ferrell, 2002).

3.1. The digital training program of the U.S. Army

The U.S. Army soldiers lack skills dedicated to technological knowledge base and information space management to fully understand and exploit network-centric technologies (Ferrell, 2002). One of the reasons usually putting forward is that soldiers are not enough familiar with such technologies and are not intuitively knowledgeable of their specific use in the decision making process (Haynes, 1998). The U.S. Army Training and Doctrine Command (TRADOC) recognizes the need for a new way of thinking to enable soldiers to use networked technologies in line with the digitalization expectations. Currently, the acquisition and development of “skills” and “knowledge embodied in technical system” represent a highest priority for the U.S. Army in order to achieve its strategic objectives (Brown, 2003).

The TRADOC actually proposes a digital learning program which is expected to produce “digitalization smart” soldiers. The program is supposed to provide soldiers with both essential technological skills and task-based knowledge concerning the use of technologies in the collective decision making process. The TRADOC digital training strategy relies on a complete integrated training program, from individual development to collective training.

More precisely, the program consists in three steps which are gradually triggered (Ferrell, 2002). Step 1 offers individualistic training and learning facility. The individual training module enables soldiers to update previously acquired skills when changes in equipment and software are introduced. This step focuses on the individual development through learning by doing and learning by using. During step 2, soldiers are considered as members of teams (sections, for instance). They acquire basic skills related to acquisition, exchange, and use of digital information. This second learning module enables soldiers to capitalize and refine digital tactics, techniques and procedures in order to improve knowledge sharing and decision making process within its team. Step 3 introduces learning at the level of units or organizations (brigade and below, for instance). It focuses on planning and execution tasks using digital collaborative tools. Step three looks beyond essential technological skills since it takes into account relational and collective skills.

Notwithstanding the U.S. Army training strategy provides its members with a complete program which articulates individual and collective learning types, it establishes a rather deterministic vision of digital learning. This vision tends to focus on the accumulation of codified technical knowledge by individual team members, and on the diffusion of such technical knowledge through standardized procedures. In that way, the U.S. Army considers that an essential complement to the current digital training is to leverage collective skills and knowledge through team self-development (Brown, 2003). The strategy which could be adopted by the U.S. Army may rely on mixing the individual and team steps in order to achieve improvement at the organizational level. Such a mixing process requires the exploitation of tacit forms of knowledge and the implementation of informal contexts of learning through a less deterministic approach of digital learning.

3.2. The development of technical skills through the linear articulation of individual and collective learning

The method adopted by the U.S. Army to develop net-centric technological skills is based on the linear articulation of individual and collective learning mechanisms. An organizational learning process is said to be linear when the steps, levels and/or types of learning it combines are linearly linked together. In the process of acquiring what Leonard-Barton (1992) calls “skills and knowledge base” and “knowledge embodied in technical systems”, various types of learning are linearly linked together to form a step-by-step cycle. Such a cycle leads to the

acquisition of core technical capabilities through the combination of three (simple) learning mechanisms: learning by doing, learning by using and learning in teams. Basically, these types of learning improve the design of technical systems, and provide organizations with effective mechanisms for developing technical knowledge and practices.

Learning by doing involves the cumulative development of technical knowledge and skills (Teece et al., 2001: 101). It is based on the accumulation of knowledge and experiences in exploiting a particular technology, achieving a particular task or realizing a particular activity. Not surprisingly, learning by doing is frequently associated with learning by using. Indeed, the latter corresponds to the process by which the technical characteristics of a given technology are determined through feedback from final users who have accumulated experience with the technology (through learning by doing). Learning by doing and learning by using are thus complementary processes that build on knowledge accumulation (Zollo and Winter, 2002), imitation and internalisation (Nonaka, 1994). Since they put a particular emphasis on the repeated execution of similar tasks within formal learning contexts, we consider that the articulation of these types of learning refers to ‘first-order learning complexity’.

Furthermore, each type of learning can support collective learning (e.g., learning in teams and units). Learning in teams consists in more deliberative processes through which individuals exchange opinions and ideas, and collaborate in order to improve organizational performance. This process leads to the articulation of a kind of implicit knowledge related to individuals’ understanding of the causal linkages among action, technology and performance. However, learning in teams provides organizations with formal contexts of learning which do not allow for enactive dynamics to emerge. This type of collective learning corresponds to what Amin and Cohendet (2004) call a ‘hard’ infrastructure of learning. In such a vision, learning in teams is similar to learning in any other functional group that holds specific forms of knowledge or competences within the organization. Learning in teams refers to a mode of management which is based on the dominance of hierarchical relationships and a routine-based architecture for coordinating inter-individual knowledge and actions (Amin and Cohendet, 2004: 112).

This aspect of learning reinforces the notion that the development of technical skills and knowledge embodied in technical systems relates to first order learning complexity. As such it

refers to a formal context of learning in which (i) the outcomes of the learning process are predetermined, (ii) the procedures individuals follow are codified, and (iii) the interactions and communications are team-based. Table 1 summarizes the characteristics of the digital training program.

Type	Level	Context
Learning by doing	Learning type I	Individual learning
Learning by using	Exploitation	Learning in teams

Table 1: The digital training program

Next section (§4) discusses the characteristics of the education and training programs that the U.S. military experiment to create, transform and disseminate joint core capabilities. It describes how the U.S. forces leverage cooperation through joint education and joint training initiatives.

4. Leveraging cooperation between individuals to develop shared “values and norms”

Current operations in Afghanistan and Iraq daily demonstrate the need for experienced and proficient joint-minded officers. Indeed, effective cooperation between Services is essential to ensure high quality and timely decision making process in modern wars. In that way, all Services have to work more synchronously, and command and control must be truly interoperable and interdependent. However, developing joint capabilities represent a difficult task for the U.S. forces. They lack joint culture and joint practice due to a deeply Service-centric approach of warfare. Despite improvements, reports from the fields point out many failures concerning joint capabilities. For instance, in *Operation Iraqi Freedom*, the information system used by U.S. Army soldiers (the so-called *Blue Force Tracker*) does not communicate with the U.S. Marine Corps command and control personal computer (Greenwald, 2007). Even when interoperability is provided, warfighters have to deal with many problems of understanding and interpretation. For example, the lack of certification standards for joint controllers on the ground and joint air controllers often challenge Close Air Support missions (Harrison, 2005; Greenwald, 2007).

4.1. The joint military education and training programs of the U.S. forces

The Department of Defense (DoD) seeks to provide solutions to the previous issues by focusing on interoperability, and the development of joint operations. Following senior commanders, the Department of Defense recognizes the need for officers to share work practices and cultural values in order to achieve joint command and control capabilities. Shared knowledge environment allows officers to improve mutual understanding of each other's context of action. Mixing individual and collective learning processes, they build up a common work environment which, in turn, reduces the probability for misinterpretations and communication failures to come up.

Acquiring and leveraging shared “values and norms” appear as a critical capability for the U.S. forces to succeed in modern wars. In that way, the Department of Defense develops two different strategies: the first one focuses on military joint education program and the second one leverages joint training. Joint professional military education is grounded on two stages. Stage one is covered by the initial Service-based formation. Stage two puts together officers from all Services within different colleges such as Joint Force Staff College (National Defence University) or National War College. This second stage represents the core of the joint program education (Thie *et al.*, 2005) since it exposes joint fundamentals (Schweikert, 2005). Officers improve their knowledge about other Services, the ways they work and conduct the war (Meyer, 2004). Moreover, since officers interact and have daily face-to-face exchanges, they learn from one another, they share experiences, viewpoints and discuss the problems they faced and the solutions they brought. The second stage enables a socialization process to emerge; it represents a sort of guidance for common values and behaviours.

Joint training programs stress on learning through experimentation mechanisms. Joint training enhances the development of common cultural values and work practices through shared experiences and action. There are ongoing efforts by the Department of Defense to create a Joint National Training Capability (JNTC). These initiatives bring joint forces together in live or virtual environment. More precisely, JNTC links the tactical, operational and strategic players in a single exercise to increase coordination effectiveness (Harrison, 2005). For instance, ground and air forces have opportunities to train together in order to improve Close Air Support missions.

To achieve such results, Joint National Trainings structures (i) build on existing Service interoperability to develop horizontal training, (ii) connect component and joint command and staff planning and execution to improve vertical training, and (iii) provide integrated facilities and functional training exercises (DoD, 2003). Joint trainings enable warfighters throughout the armed forces to operate from the same base of knowledge and to develop shared values and norms.

4.2. The development of joint core capabilities through the coordination of distinctive types and levels of learning

The concept of cooperation is located at the interface of individual and collective behaviours. Cooperation involves the active participation of individuals, and the coordination of their contributions and actions to achieve common organizational objectives. It also requires intensive interactions and communications between members of distinctive communities, groups and teams within the organization. It is based on specific information and communication technologies, and is facilitated by interpersonal trust and other motivational factors (van den Hooff et al., 2003). In that way, joint education initiatives are critical. They provide the U.S. military with capabilities which are essential for exploiting the benefits of net-centric models of warfare. Joint education programs are based on the exploitation of the relationships between individuals in order to facilitate the development of joint work practices, standards, codes, languages, norms and values. The ultimate objective of joint education programs is to enable soldiers and commanders to develop a joint culture of warfare. Hence, achieving jointness involves the emergence of a shared knowledge environment which transcends the traditional boundaries between Services. In this context, net-centric technologies support the implementation and exploitation of cooperative models of decision and action, and provide individuals with additional resources for sharing knowledge and collaborate.

As mentioned above (§4.1) the acquisition of joint core capabilities by the U.S. military is based on two distinctive learning initiatives: joint education and joint training. Joint training requires simulating operational situations in which joint problems might emerge. It corresponds to a form of learning by experimentation within artificial environments which reproduce real operational contexts. The outcomes of joint training programs are thus related to incremental improvements of joint operating procedures through trial and error processes

within artificially controlled exercises and contexts of action. As such, joint training corresponds to single loop learning or learning type I (Bateson, 1972; Argyris and Schön, 1996). Subsequently, joint training does not involve radical modifications of the procedures which generate joint actions, but incremental changes. It is merely based on individual as well as collective unit-based experimentations which drive the adaptation of existing procedures. In contrast, the joint education program refers to emerging joint values and norms (cf., second step). It is based on a long term process of socialization which leads to the continuous diffusion of renewed (Service-based) procedures. Since these procedures emerge within explorative contexts and trigger the evolution of cultural schemes, organizational values and social norms, they should be considered as the outcome of a double loop learning process or learning type II (Bateson, 1972; Argyris and Schön, 1996).

The major implication of the previous analysis is that the development of joint core capabilities involves the articulation of distinctive types of learning (i.e., socialisation *versus* experimentation), each referring to different learning level (i.e., single loop *versus* double loop learning). In particular, the development of joint capabilities is supported by the articulation of a Service-based single loop approach of learning with an inter-Service double loop approach which leads to the creation of joint values and norms. These elements are tested, evaluated and standardized through experimentation before they get shared and disseminated through socialization. The articulation of distinctive types and levels of learning refers to the second-order learning complexity. Table 2 summarizes the characteristics of the joint education and training programs.

Type	Level	Context
Experimentation	Learning type I	Collective learning
Socialization	Learning type II	

Table 2: The joint education and training programs

Next section (§5) presents how the U.S. Army improves its long run adaptive capability through the management of lessons learned and the development of leadership. It discusses third-order learning complexity and focuses on the role played by leadership in facilitating organizational learning.

5. Improving “managerial systems” to develop long-run adaptive capability

In the process of organizational transformation, creating and managing contexts that maximize the organization ability to learn effectively over time is critical (Thomas et al., 2001). The U.S. Army is highly focused on such long-run adaptive capability. More precisely, senior commanders frequently insist on the need to dynamically and recursively learn from past and current operations in order to guide and improve “managerial systems” (Lackey, 2003; Schwartzman, 2003; Spain, 2007).

5.1. The management of lessons learned in the U.S. Army

The purpose of the Center for Army Lessons Learned (CALL) is precisely to create expert-enhanced learning tools for use in managing operational events, at the tactical, operational or/and strategic levels. CALL puts knowledge reachback into practice in providing warfighters with knowledge resources and tools they need to effectively perform on the battlefield (Lackey, 2003). CALL has a vast reservoir of knowledge, including its own lessons learned publications, observations made by experts on the battlefield, and after-action reports. Moreover, CALL possesses training feedback products from the Combat Training Centers (CTCs). Such effective linkages with live or virtual training environments enlarge benefits of dynamic and recursive learning. Indeed, CTCs provide warfighters with replications of current operational contexts that allow them to exercise potential solutions to new problems set (Cone, 2006). Training scenarios prepare units to integrate new technologies into their daily work practices and place special emphasis on operations in urban terrains. During trainings, warfighters represent a pool of experts that CALL is able to draw upon for incorporating new lessons into practice (see, SECI spiral, Nonaka, 1994).

Within this framework, the U.S. Army highlights the crucial role plays by leaders in developing long-run adaptive capability. Today, Army leaders operate within a complex and versatile environment. They have to realize a full spectrum of operations, from stability and support operations to high-intensity conflicts in joint organizations. In that way, the U.S. Army leaders use multiple tools which help them to adapt quickly. Leaders benefit from combat trainings as they provide irrefutable feedbacks on their tactical choices performance (Cone, 2006). However, after-action reviews indicate that leaders need additional sources of learning (Kilner, 2002) that enable them to adapt and succeed in specific and changing

circumstances. CALL knowledge reservoir is one of these supplementary sources. It takes time to analyze and put into practice documents as publications and reports. Another learning context actually used by leaders is online Communities of Practice (CoPs). CoPs are defined by a spirit of collaboration and encourage both discussions and self-analysis. Leaders share their command-related stories, ideas, and tools with others commanders. For instance, the implications of combat transformation in Iraq have been recently discussed on companycommand.com. Leaders provided on line data, information and knowledge-sharing practices. In that way, CoPs provide leaders with “just-in-time” learning (Kilner, 2002).

5.2. The role played by leadership and the articulation of distinctive types, levels and contexts of learning

In seeking to make operational experiences and expertise valuable (cf., the CALL), the U.S. Army underlines the role played by the leaders in creating, maintaining and disseminating a positive attitude toward change. The role played by leaders during periods of organizational change is exemplified in the works of scholars who focus on the concept of “transformational leadership” (Tichy and Devanna, 1986). Transformational leadership insists on those members of the organization who are capable to create visions of a desired future state and to obtain subordinate commitment to change. This point establishes a fundamental link between the study of organizational learning as the main locus of change within organizations, and the role played by transformational leaders as facilitators of organizational adaptations (Sandler, 2003).

Following our framework, the main problem is to design mechanisms for linking and coordinating heterogeneous learning contexts. By insisting on the leader as a central agent of organizational learning, we suggest that the role of the transformational leader is to articulate distinctive learning contexts. In line with this vision, the leader could provide a weak tie between distinctive groups, teams, and communities, and support modes of interaction that encourage people to share common values, goals, memories, stories and cognitive schemas. Within this framework, the articulation of distinctive types, levels, and contexts of learning (i.e., third order learning complexity) critically depends on a particular actor within the organization.

However, inconsistencies might emerge at the level of the coordination and complementarities between the distinctive learning contexts involved in third order organizational learning. Here, the role of the transformational leader might be to prevent interacting groups of people from becoming homogeneous social entities, unable at exploiting diversity, and generating new ways of conceptualizing things. As Amin and Cohendet (2004: 116-117) argue, the key management challenge is to strike a delicate balance between existing routines and the exploration of novelty. To avoid problems related to the lack of variety that might emerge through over specialization of practices and competences, managers should find appropriate means for integrating heterogeneous learning contexts. Here again, the transformational leader might play the role of an integrator and a translator who seeks to achieve a delicate balance between exploitation of existing routines (e.g., Learning type I) and the exploration of novelty (e.g., Learning Type II).

By relying on a single agent (e.g., the transformational leader) that connects distinctive learning contexts, the organization might ensure the daily engagement of people that share purpose and expertise. It follows from the previous discussion of transformational leadership and organizational learning that (i) learning contexts must be intentionally designed and promoted within the organization, (ii) different types and levels of learning must be articulated within the organization, and (iii) attention should be focused on certain types of interaction that require personal engagement. In this respect, the role played by the leader is critical since it connects, integrates and articulates distinctive learning contexts which are related to different types and levels of learning (third order learning complexity). Table 3 summarizes the characteristics of the digital training program.

Type	Level	Context
Lessons Learned (e.g., Nonaka's SECI spiral)	Learning type I Learning type II	Learning in teams Communities-of-practice Transformational leadership

Table 3: The lessons learned management initiative (CALL)

Figure 2 provides a graphical view of the distinctive contexts, levels and types of learning we investigated in the previous sections.

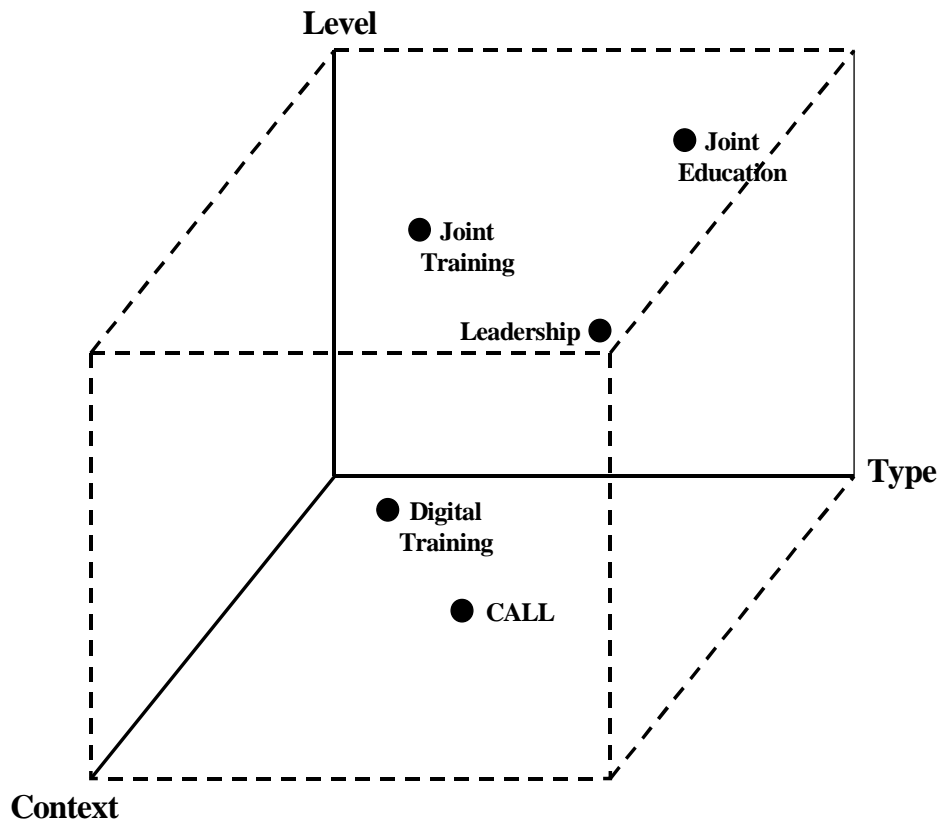


Figure 2: A graphical representation of the U.S. military's Learning Space

6. Conclusion

This paper provided a theoretical framework and develops a conceptual tool (3D Learning Space) for studying organizational learning. Our framework and assumptions focused on the nature of organizational learning, and insisted on the variety of individual and collective learning types, levels and contexts which must be articulated in order to provide organizations with effective core capabilities. Focusing on three distinctive military education and training programs, we suggested that organizational learning involves the management of a variety of learning types, levels and contexts which reflect the organization's learning strategy. Within this framework, we defined organizational learning as a dynamic capability which enables the organization to manage various degrees of organizational learning complexity (e.g., first order, second order and third order learning complexity).

This view of organizational learning is complementary to the resource-based view and the evolutionary perspective of the organization. According to these approaches, an organization learns to adapt to changing circumstances by acquiring, developing and renewing its repertoires of routines competences and capabilities through various types of learning. Our next research shall be dedicated to refining and extending the conceptual framework we introduced in this paper.

7. References

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